

# Unit 11 - Topic 3

## Reactivity & Table J

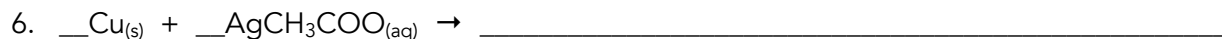
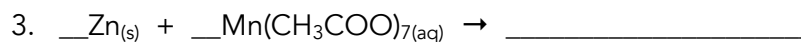
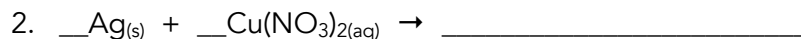
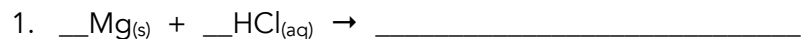
### Applying the Activity Series

During a single replacement reaction, one element takes the place of another in a compound. Many compounds such as copper (II) sulfate, consists of two parts; a metal (copper) and a non-metal (sulfate).

When a metal such as zinc is dropped into a solution containing copper (II) sulfate, its natural tendency is to combine with the sulfate by giving electrons to it. The sulfate's outer shell is already full, however, because it has already gained electrons from the copper.

As a result, however, the copper has room for zinc's electrons. If zinc can force copper to take its electrons, zinc can become a cation and take copper's place in the compound. Whether or not the zinc can take the copper's place depends upon which metal has the greater tendency to lose electrons. Scientists have determined by experimentation which metals can replace each other in aqueous solution. This resulted in the development of the *Activity Series* as shown in Table J to the right. The most active metals and non-metals are shown toward the top. Elements at the top of the activity series can replace those below them.

**For each example below, if a reaction will occur based on the elements' positions in the Activity Series, complete the equation and balance it. If there is no reaction, write no reaction.** [NOTE: for metals, the format for single replacement reactions is  $AB + C \rightarrow CB + A$ ; for non-metals the format is  $AB + D \rightarrow AD + B$ ]



**Table J**  
**Activity Series\*\***

|       | Metals           | Nonmetals       |       |
|-------|------------------|-----------------|-------|
| Most  | Li               | F <sub>2</sub>  | Most  |
|       | Rb               | Cl <sub>2</sub> |       |
|       | K                | Br <sub>2</sub> |       |
|       | Cs               | I <sub>2</sub>  |       |
|       | Ba               |                 |       |
|       | Sr               |                 |       |
|       | Ca               |                 |       |
|       | Na               |                 |       |
|       | Mg               |                 |       |
|       | Al               |                 |       |
|       | Ti               |                 |       |
|       | Mn               |                 |       |
|       | Zn               |                 |       |
|       | Cr               |                 |       |
|       | Fe               |                 |       |
|       | Co               |                 |       |
|       | Ni               |                 |       |
|       | Sn               |                 |       |
|       | Pb               |                 |       |
|       | **H <sub>2</sub> |                 |       |
|       | Cu               |                 |       |
|       | Ag               |                 |       |
| Least | Au               |                 | Least |

\*\*Activity Series based on hydrogen standard